

Methods of iterating

Project: Chinese guardian lion

Tool: 3D Printer

3D printing (Additive Manufacturing) is a technology that builds physical objects by layering materials sequentially. Unlike traditional subtractive manufacturing methods (such as cutting or carving), 3D printing directly relies on digital models (3D CAD designs) to construct objects. It offers high freedom, personalized customization, and rapid manufacturing advantages.

Among the many features of 3D printing, the unique nature of additive manufacturing has deeply intrigued me. To gain a deeper understanding of the 3D printing process and principles, I have chosen the traditional Chinese stone lion as my printing object. This sculpture is renowned for its intricate details and fine carvings, leading me to explore the following questions:

- Can 3D printing fully reproduce the intricate details of the Chinese stone lion?
- What unexpected challenges or interesting phenomena will arise during the printing process?







Draft1



4



Initially I was curious about the cross-sections of 3D printed objects.

Can the cross-sections of 3D prints be converted into 2D graphics?

• Each layer in 3D printing is essentially an independent cross-section. If we extract these slices individually, can they be visualized as 2D graphic representations?

 Can this method be applied to graphic design, creating a new visual language? g

S.

Test1





Try making the "printing lines" in the lion into 2D graphics and print them on different materials to see what effect it produces.





Test2





I have seen 3D printing used to make fabrics in fashion design.

Test3



Card

When reprinting the object, I chose to retain its support structure. In 3D printing, supports typically serve a purely auxiliary function. But what if we shift our focus and make the support structure itself the subject of observation? What kind of effect would that create?

Ball

Reference

Rachel Whiteread

Rachel Whiteread is one of the preeminent sculptors of her generation. Her practice is defined by an ongoing investigation of domestic architecture and the traces of humanity impressed upon such sites. She casts the spaces inside and around objects – be they bathtubs or mattresses, architectural elements such as doors, floors and windows, or even entire buildings – and uses materials such as resin, rubber, concrete, and plaster to preserve each surface detail. The resulting sculptures are remarkably faithful to their source molds, but also uncannily foreign in that they represent an inverse of the original object and require a constant reorientation of perception. Absence is made present, interior becomes exterior, and the invisible is rendered visible.

Reflection:

She pays more attention to the internal space of the object, so I think the internal space is often neglected in 3D printing. Maybe I can try to remove the outside of the 3D printed object and only keep the internal support of the object.

Draft 2

Chinese Mortise and Tenon Structure

Question: What would it be like if the same building was printed using 3D printing?

Introduction to Mortise and Tenon Joints:

The Chinese mortise and tenon structure is a traditional woodworking technique that has been used in Chinese architecture, furniture, and construction for over two thousand years. This ingenious method connects wooden components without using nails, screws, or glue, relying instead on precisely crafted interlocking joints.

At the same time, another feature of Chinese mortise and tenon structure is that buildings can be constructed without the need for external support.

Support

Hall of Supreme Harmony

Xiùqĭ Pavilion

Yingxian Wooden Pagoda

Chuíhuā Gate

In my ongoing iterative experiments, I decided to integrate traditional Chinese mortise-and-tenon structures into my research, attempting to reinterpret this ancient architectural wisdom through 3D printing technology. Mortise-and-tenon, as the pinnacle of traditional Chinese woodworking, requires no nails or glue, relying solely on the interlocking force and mechanical balance between wooden components to form a stable self-locking structure—without any additional support.

I selected seven classic mortise-and-tenon structures for 3D printing experiments. However, the essence of mortise-and-tenon lies in precise calculations and a self-sustaining logic, whereas the nature of 3D printing is layer-by-layer stacking, which requires support structures to prevent collapse. When using 3D printing to construct mortise-and-tenon architecture, it paradoxically relies on a large number of additional support structures for stability.

I see these extensive support structures as more than a technical necessity; they symbolize a clash between tradition and modernity, a dialogue between human craftsmanship and machine-driven construction. This experiment ultimately led me to shift my focus from

the architectural body to the 'negative space' formed by the support structures.

Mingyuan Tower

Yucui Pavilion

Reflection

In traditional manufacturing logic, support structures are merely auxiliary tools, removed after their function is fulfilled—much like scaffolding on a construction site or temporary supports in sculptural carving. However, when support structures themselves become the focus of observation, can we redefine their significance? If the main subject is removed, leaving only the support structures, does it imply that: • The traditionally "auxiliary" concept is transforming into a new form of independent visual expression? • This challenges our categorization of objects – are support and subject, function and ornament, technology and art, still distinct boundaries?

Michel Foucault, in The Order of Things, explores how knowledge is classified, assigned value, and shapes our perception of the world (Foucault, 1970).

- He asserts that the meaning of objects is not fixed, but rather determined by the way we construct their classification systems. This concept is validated in the 3D printing support structure experiment:
- Traditionally, support structures are auxiliary, while the
- primary object is central.
- However, when we shift our perspective, the support structure itself becomes the subject—while the main object remains but is hidden in the background—thus subverting the original notion of object hood.

If support structures were once considered secondary but now take center stage, does this challenge our established understanding of form, function, and classification systems? Foucault argues that what we recognize as an object is not inherently given but is a result of constructed knowledge systems.

The transformation of support structures—from an overlooked functional element to a symbolic artistic language—illustrates this very process. It is no longer merely a byproduct of the printing process; instead, it presents a new way of seeing, a critical reflection on fixed thinking.

The role of support structures in 3D printing has evolved from a technical necessity to an independent visual subject – not just an experiment in materials and technology but a reconstruction of observational logic. Support structures are no longer temporary; instead, they can be examined, analyzed, and even imbued with new meaning.

Final Outcome

Graphic Communication Design | 24-25

Y,

Di Zheng

Draft3

Graphic Communication Design | 24-25

Di Zheng

Rachel Whiteread is one of the preeminent sculptors of her generation. Her practice is defined by an ongoing investigation of domestic architecture and the traces of humanity impressed upon such sites. She casts the spaces inside and around objects - be they bathtubs or mattresses, architectural elements such as doors, floors and windows, or even entire buildings - and uses materials such as resin, rubber, concrete, and plaster to preserve each surface detail.

•

Graphic Communication Design | 24-25

Di Zheng

